# Climate Change and Human Health Literature Portal

National Institute of
Environmental Health Sciences

# Climate and tick seasonality are predictors of Borrelia burgdorferi genotype distribution

| Author(s): | Gatewood AG, Liebman KA, Gwenaël Vh, Bunikis J, Hamer SA, Cortinas R, Melton F, Cislo P, Kitron U, Tsao J, Barbour AG, Fish D, Diuk-Wasser MA |
|---|---|
| Year: | 2009 |
| Journal: | Applied and Environmental Microbiology. 75 (8): 2476-2483 |

**Abstract:**

The blacklegged tick, Ixodes scapularis, is of significant public health importance as a vector of Borrelia burgdorferi, the agent of Lyme borreliosis. The timing of seasonal activity of each immature I. scapularis life stage relative to the next is critical for the maintenance of B. burgdorferi because larvae must feed after an infected nymph to efficiently acquire the infection from reservoir hosts. Recent studies have shown that some strains of B. burgdorferi do not persist in the primary reservoir host for more than a few weeks, thereby shortening the window of opportunity between nymphal and larval feeding that sustains their enzootic maintenance. We tested the hypothesis that climate is predictive of geographic variation in the seasonal activity of I. scapularis, which in turn differentially influences the distribution of B. burgdorferi genotypes within the geographic range of I. scapularis. We analyzed the relationships between climate, seasonal activity of I. scapularis, and B. burgdorferi genotype frequency in 30 geographically diverse sites in the northeastern and midwestern United States. We found that the magnitude of the difference between summer and winter daily temperature maximums was positively correlated with the degree of seasonal synchrony of the two immature stages of I. scapularis. Genotyping revealed an enrichment of 16S-23S rRNA intergenic spacer restriction fragment length polymorphism sequence type 1 strains relative to others at sites with lower seasonal synchrony. We conclude that climate-associated variability in the timing of I. scapularis host seeking contributes to geographic heterogeneities in the frequencies of B. burgdorferi genotypes, with potential consequences for Lyme borreliosis morbidity. Copyright © 2009, American Society for Microbiology. All Rights Reserved.

**Source:** http://dx.doi.org/10.1128/aem.02633-08

## Resource Description

**Early Warning System:** ⊠

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

**Exposure :** ⊠

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Meteorological Factors, Temperature

**Temperature:** Fluctuations

**Geographic Feature:** ☒

resource focuses on specific type of geography

 None or Unspecified

**Geographic Location:** ☒

resource focuses on specific location

 United States

**Health Impact:** ☒

specification of health effect or disease related to climate change exposure

 Infectious Disease

 **Infectious Disease:** Vectorborne Disease

 **Vectorborne Disease:** Tick-borne Disease

 **Tick-borne Disease:** Lyme Disease

**Mitigation/Adaptation:** ☒

mitigation or adaptation strategy is a focus of resource

 Adaptation

**Model/Methodology:** ☒

type of model used or methodology development is a focus of resource

 Exposure Change Prediction

**Resource Type:** ☒

format or standard characteristic of resource

 Research Article

**Timescale:** ☒

time period studied

 Short-Term (

**Vulnerability/Impact Assessment:** ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

 A focus of content